ON

THE EFFICACY OF

CARBONIC ACID GAS

IN THE

DISEASES OF TROPICAL CLIMATES;

WITH DIRECTIONS FOR THE TREATMENT OF THE ACUTE AND CHRONIC STAGES OF DYSENTERY.

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"CAUSE."

In entering on an inquiry respecting the treatment of the diseases of tropical climates, it is necessary, in order to understand the *modus operandi* of the medicine about to be proposed, to consider, first, what causes are chiefly concerned in the production of such affections. Unless clear and distinct notions are entertained upon this point, our practice, instead of being scientific and based upon sure and fixed principles, would be wavering, uncertain, and altogether empirical. We will, therefore, shortly consider what are the probable causes of the complaints about to be brought under consideration; and, in so doing, follow the distinction usually made by other writers in dividing these causes into two, viz. the remote, and the proximate.

The remote cause may be defined, the circumstance, or combination of circumstances, by which the Agent productive of these morbid phenomena is formed, or becomes generated. It is not, however, my intention, at the present moment, to enter into any discussion as to the mode by which the poison productive of these diseases is itself produced, as this will require a separate and distinct consideration, and as it is my purpose to recur thereto on a future occasion. It is sufficient at present to state, that, in certain localities (more particularly in tropical climates) a gaseous or other substance having been generated, by certain causes, in the bowels of the earth, is afterwards extricated in greater or less abundance from the surface, and becomes diffused throughout the surrounding atmosphere. In this situation it is liable to be taken into the lungs together with

the air inspired by man; and, when present to any great extent, to be productive both of disease and death. That to this single and almost universal cause is to be ascribed the greater number of those diseases to which the human race is subject, there can be little doubt; for, although the agent productive of them has never yet been collected or analysed, its existence is as well known as that of the most subtle of all agents, light; while the laws regulating its extrication from the earth, and its diffusion in the atmosphere, are as well understood and as clearly defined as those of gravity itself.

We know the circumstances which favour, and also those which retard, its extrication from the surface, and its diffusion in the atmosphere. More than this, we are acquainted with its specific gravity, the substances for which it has an affinity, and the soils from which it is extricated in the largest quantity, and with the greatest rapidity. Thus, it has been found to possess a specific gravity greater than that of atmospheric air, always existing in more abundance near the earth's surface than at a given elevation above it. Like vapour, or common air, however, it becomes raised during the day by the expansive force of caloric, or the warm rays of the sun; but again descends, in accumulated quantity, after the setting of this luminary—as is well known to the residents at Rome and other malarious districts, who carefully avoid exposure to the influence of this agent at that moment when the dews of evening are about to fall. At Batavia, also, and many other towns within the tropics, where all the different circumstances are combined which favour the extrication of this deleterious agent from the earth, it is almost certain death for an European recently arrived to sleep on shore, even for a single night, although the same spot may be traversed, with comparative impunity, during the day. This substance has also an affinity or attraction for water, the

earth's surface, and even for trees and other substances. Thus, tracts from which it is evolved are not productive of any injurious effect until the soil has become to a certain extent exsiccated; while again, the covering of the same or other lands, at a time when the malarious agent is being extricated to the detriment of the surrounding inhabitants, has been sufficient to prevent its further diffusion. It also appears to be dissipated by passing over a river, or even a small rivulet. And lastly, it is proved by fatal experience, that this invisible agent is extricated in greatest quantity from low, marshy, and alluvial soils; in a less degree from tertiary formations; to a very small extent on secondary strata; and not at all on primary rocks.*

When thus generated, and diffused in the atmosphere, it is productive of a series of changes in the healthy functions of the human body, which constitutes what is termed the proximate or immediate cause of disease. This we are warranted in inferring arises from the inspiration of the tainted air, and the introduction of a deleterious substance into the circulating system. I have before attempted to show, in considering the physiology of two particular diseases—the Epidemic Cholera and Intermittent Fever—that the effects witnessed in these instances are produced by the presence of a poison in the blood. I have only to add, that

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* Independent of the evidence we have of the existence of this mysterious agent by its effects on man, we have other proof also, little less conclusive, of its deleterious action on the animal economy, by what is observed when meat is exposed in situations where malaria is generated in abundance. In such cases, flesh of all kinds invariably runs into a putrefactive state very rapidly, thus showing that this invisible agent is capable of destroying those affinities which hold together the constituent elements of animal bodies. Neither is its destructive operation confined to animal substances—it seems to have an equally injurious effect on vegetable as well as every other kind of organized matter. Thus flax, silk, and even cotton and woollen cloth, exposed to *marsh miasmata* rapidly undergo decomposition, have their organization destroyed, and become putrid, and filled with innumerable animalculæ.

I believe the whole of the phenomena exhibited by the class of diseases now under consideration, are immediately produced by the same cause—the presence of a poison in the sanguineous mass, and its determination to particular organs, and particular parts of the body.

Besides the above two principal causes, there are others, which exert an indirect influence in the production of these as well as all other diseases. They are termed predisposing, or exciting.—The first of these may be defined particular idiosyncrasies, certain modes of living, the debilitating effects of previous attacks of disease; and, in fine, whatever debilitates the body, or lowers the energy of the nervous system, either directly or indirectly.—The exciting causes are fatigue, the inhalation of an impure atmosphere, fright, dread of the disease, defect of the accustomed stimuli from want of food, &c., and the temporary debility or loss of tone, either to the stomach or system, consequent on excesses of every kind.

"EFFECTS."

From a consideration of the causes, we may now pass on to a slight review of the effects, of this most destructive agent on the health and life of man. These would appear to be much greater and more extensive than is generally known, or, at least, acknowledged. The most common result, and one from which few climates are entirely exempt, is that of intermittent fever, or ague. In addition to intermittent, remittent, and continued fever, are also effects of one and the self-same cause. This is satisfactorily shown by many various and conclusive facts. In climates where the temperature is great, we have intermittent, remittent, and continued fevers, succeeding each other with the increase of heat; or these complaints again follow each other in succession—only in an inverse order—as the cool days of autumn take place of the sultry heats of summer. In addition, these various fevers are often found prevailing at one and the same time in particular localities; the continued fever being the prevalent form of complaint on low and swampy grounds; the remittent, in situations more elevated; and the intermittent on still higher lands, at an elevation considerably above the source from which the malaria is extricated. This difference may be said to arise from two several, though combined circumstances—temperature and distance. The former, when excessive, predisposes the body to be more easily acted on by the specific cause; and the latter, by placing the individual nearer the source from whence the malarious agent is extricated, causes him to receive into the system a larger quantity of the morbific matter—and hence the severity of the disease. Lastly, we not only observe this variation in different individuals, according as they are placed in

one or other of the above circumstances, but we may sometimes witness the phenomenon in one and the same person; the continued fever being followed by the remittent, and the remittent by the intermittent,—or the reverse.

We must, therefore, conclude that the continued and remittent of warm climates, and the intermittent fever of cooler ones, are produced by one and the self-same cause—the presence in the system of a poison to which the term malaria has been applied by Italian writers. How widely malaria is a cause of death will be apparent, as Dr. Macculloch observes, almost on a moment's consideration, when we recollect that, in all the warmer and thence more populous countries, nearly the entire mortality is the produce of *fevers*. This remark holds good not only with respect to intertropical climates, but to many situations placed without the tropical boundary; for although the effects witnessed vary to a certain extent, the cause by which they are produced is the same in almost every instance. To show this in its clearest and most conspicuous light, we may look to what is considered (as far as temperature and climate are concerned) one of the most delightful countries of the terrestrial globe. "Let us," in the words of Dr. Macculloch, "turn to Italy: the fairest portions of this fair land are a prey to this invisible enemy; its fragrant breezes are poison; the dews of its summer evening are death. The banks of its refreshing streams, its rich and flowery meadows, the borders of its glassy lakes, the luxuriant plains of its overflowing agriculture, the valley where its aromatic shrubs regale the eye, and perfume the air—these are the chosen seats of this plague, the throne of malaria." *

Next to Italy, that country in Europe where malaria

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* Essay on Malaria, page 6.

most abounds is, perhaps, Spain ; and the spot in which it is produced in the greatest quantity, the rich and alluvial plain whereon is built the city of Valencia. To show the extent to which malaria is generated in this situation, I may state that, out of about 3,000 patients admitted into the general hospital of that city,* more than two-thirds were labouring under remittent and intermittent fever, principally the latter. It is not, however, in the town of Valencia that we can judge of the destructiveness of this merciless fiend. It is necessary to visit the neighbouring fields and rice grounds, in order to estimate the width of its range, and the amount of mortality consequent on its deleterious influence. In the months of July, August, and September, what is called the malignant ague begins to prevail, carrying off great numbers annually ; the patient dying at the second, third, or fourth accession, in a state resembling the collapse of cholera, excepting that evacuations from the stomach and bowels are not always present. Those who are fortunate enough to escape this autumnal scourge, become affected with the common or mild form of the disease,—which continues, if not cut short by medicine, until the following spring, or at least until the cold weather sets in, when inflammations of the thoracic and abdominal viscera supervene, and carry off many an unhappy victim.

Should the doomed inhabitant of this pestiferous region escape all these trials, there yet remain the host of chronic affections of the liver, spleen, and other abdominal viscera (without including that common termination of the whole, dropsy), to sap the foundation of life, and hurry the sufferer to an early grave. In fact, it has been satisfactorily shewn by one Spanish writer, on the topography of this province, that, were it not for

* In the year 1833.

the constant influx of strangers from other and healthier districts, this fertile, but to its cultivators destructive, plain would have been depopulated over and over again, during the past century alone. "A moment's reflection," as Dr. Johnson observes with much truth, "must shew us that fever and ague, two of the most prominent features of the malarious influence, are as a drop of water in the ocean, when compared with other less obtrusive but more dangerous maladies, that silently, but effectually, disorganize the vital structures of the human fabric, under the operation of this deleterious and invisible poison. The jaundiced complexion, the tumid abdomen, the stunted growth, the stupid countenance, the shortened life, attest, that habitual exposure to malaria saps the energy of every bodily and mental function, and drags its victim to an early grave." *

But it is in the tables of the Actuary that we have the best proof of the devastating agency of this invisible, but too well known poison. "The value of life, of survivorship, the average chance of approaching to the proverbial limit of threescore years and ten is the measure of the salubrity of a country, and that salubrity depends mainly on the presence or absence, the range or limitation of malaria."† Thus in England the average duration of life is calculated at 50, in Holland, 25,‡ while in some parts of France, where this poison is generated to an unusual extent, it is only 22, 20, or even 18. In Amsterdam, the annual mortality in 1821 was 1 in 24; in Rome, 1 in 25; in Madrid, 1 in 29; in Paris, 1 in 32; in London, 1 in 40; in France, generally, 1 in 40; and in England, generally, 1 in 60.§ We thus find that the value of life is nearly double under the

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* On the Philosophy of Travelling, page 124. † Macculloch, *Ib.* p. 3.

‡ The half of human life is thus, as the last Author remarks, cut off at one blow, and the executioner is Malaria. § Vide Hawkin's Statistics.

cloudy atmosphere, and in the ever varying climate, of England, to what it is in the land of Poets and Painters, beautiful to the sight, and fascinating to the imagination, but destructive and fatal both to health and life. Even the often boasted climate of France, with its smiling vineyards and azure sky, is not more congenial to life than the smoky and dense atmosphere of London; while compared with the whole of England, the balance in favour of the latter despised and calumniated country is as 60 to 40.*

What the rate of mortality may be amongst the natives in the most malarious districts within the tropics, is not easily ascertained; but the frightful loss of life among European residents attests the vast influence of this agent in such climates. That heat alone has little to do with the production of this mortality, is well known to all who have had an opportunity of investigating the causes productive of disease in such localities. When the temperature was 120° at Madras, the troops, as we have been informed by Sir James M'Gregor, continued in excellent health, and seemingly unaffected by this great solar heat. The truth of the above remark is also brought under the notice of every naval surgeon who has entered the tropics; for although the ship in which he has embarked is becalmed for weeks, on, or near the Line, and beneath a vertical sun, the crew are seldom affected by such a circumstance. Let them,

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* "With respect to the extreme term of individual life in such cases, it is stated by many writers, that in Egypt, and in Georgia and Virginia, in all the marshy situations, it does not exceed forty; exceptions being of course understood for specific cases—while Jackson asserts that at Peterborough in the latter province, a native and inhabitant rarely attains the age of twenty-one. In various parts of Italy, Sicily, Sardinia, Corsica, Wallachia, Moldavia, and Hungary, life, whether computed in this last or in the preceding manner, presents a still more unfavourable aspect; though perhaps under the circumstances of misery beneath which this burden is borne, that shortness is a blessing rather than an evil."—*Macculloch, Ib. p.* 449.

however, make for shore, and anchor to the leeward of some pestiferous tract, and within reach of the floating miasmata, so as to *smell the land*, as it is termed,—and, although the atmospherical temperature is possibly much less, the sick list will soon prove that some new and invisible cause is in operation to affect the health, and produce both disease and death among those who were previously entirely free from all ailment. Or, to render the case still clearer, let a party go on shore to cut wood; and, although the men are perhaps less exposed to the sun's rays than on board, it will be again found that some mysterious agent has been at work, as a large proportion will be immediately attacked with intermittent, remittent, or continued fever. To the influence of malaria, and its direct action on the system, can be alone ascribed the loss of health and of life in such instances; and as to the extent of this, in particular countries and localities, the medical records of our fleets and armies in various parts of the world afford abundant evidence.*

A part of this evil has been brought on by the injudicious choice of the first settlers, both in the old and new continents; the principal settlements of Europeans being in those spots where malaria might be expected, and, indeed, is known, to be generated in the greatest abundance. This will, in general, be found to be on

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* Examples might be accumulated without end, and the history would be a fearful one, even as regards Europe. "It is said that 10,000 men were lost by Walcheren: how far the campaign itself was lost through the same cause, it is not needful to ask. It is now a less painful as well as a less offensive case, to tell, that when the French army attempted Naples in 1528, they were reduced within a few days, from 28,000 to 4,000 men, by choosing an injudicious encampment at Baiæ. Similar, and from a similar cause, was the great mortality in Hungary in 1566. There were excuses in 1528 and 1566, which did not exist afterwards, and least of all, in the last war; yet all European wars, ever since, can furnish examples in abundance of the same nature, from the ignorant or careless choice of encampments, as from other modes of ignorance and neglect, even to the selection of pestiferous situations for permanent barracks."—*Macculloch, Ib.* 227.

low, alluvial, and swampy tracts, at the mouths and banks of rivers—situations admirably adapted for commerce, and rich in all the varied productions of the vegetable world, but ill-suited, and highly destructive, to animal life. It is in such places that malaria exists to the greatest extent, a fact, however, which man, in his eager search after wealth, is alike regardless of and indifferent to, until he finds too late that he has bartered his present happiness for a good which, when obtained, he is incapable of enjoying.

But it is not the curtailment of the short span of human life that is alone to be lamented. We must regard, with no less compassion and regret, the miserable state of existence endured by the majority of those destined to inhabit the localities where malaria is generated in great abundance. As, however, the pictures which such maladies form have been painted in colours so vivid by other writers, I shall content myself with referring the reader to their numerous works, and conclude this chapter with a single quotation from an author who has devoted three octavo volumes to this single subject. "Death here," says Dr. Macculloch, speaking of Italy, (and the comparison will hold good with the greater number of the fertile and alluvial plains within the tropics) "walks hand in hand with the sources of life, sparing none; the labourer reaps his harvest but to die, or he wanders amidst the luxuriousness of vegetation and wealth, the ghost of a man, a sufferer from his cradle to his impending grave; aged even in childhood, and laying down in misery that life which was but one disease."

"TREATMENT."

HAVING concluded, as we are bound to do, that the various diseases now brought under consideration are the effects of the introduction of a poison into the system, the plan of treatment which, in this case, ought to be pursued, would appear to be that adopted with persons who have taken, either by accident or design, any particular or known poison,—as I have before remarked with respect to the Epidemic Cholera. As, however, malaria, like the poison of cholera, has never yet been collected or analysed, we are unable to discover, by experiments conducted in the usual way, or in the laboratory of the chemist, what substances are capable of uniting with this invisible element, so as to alter its properties and destroy its virulence. We are, consequently, restricted, in seeking for an antidote, to analogical deductions; to observation; or to mere chance, to which we are indebted for so many valuable discoveries.

Although, perhaps, it is a matter of indifference to the reader, and must be so in reality to the majority of those most interested in the question—the public at large—I may nevertheless state, that, having concluded, some years since, with the generality of writers on the subject, that the poison termed malaria is the product of animal and vegetable decomposition (although I now think that this admits of much limitation, if not considerable doubt); and observing also that the effects produced by this agent are similar to those known to arise from the class of poisons termed septic,—I was led to infer, that carbon, or carbonic acid, ought, in this case, to prove an antidote to the poison, and a specific for the effects it

produces when introduced into the animal economy. Being at the time in England, on sick-leave, I had at first but few opportunities of putting the truth of this inference to the test of experience; for although a large proportion of the diseases in this country are produced by the same cause as those of tropical climates, yet as only one is universally acknowledged to be an effect of the poison of malaria, viz. ague, I was unable, from the comparative rarity of this complaint in England, to obtain what I deemed might be considered satisfactory evidence on this point. The result of the experiments, however, which I did institute having confirmed the opinion I had formed respecting the remedial virtues of the different forms of carbon; and finding myself, subsequently, favourably situated for carrying on such an investigation; I remained in Spain during the past year, for the express purpose of obtaining some further and more direct evidence on the point. Finding that intermittent fever was unusually common and prevalent, and believing it to be best adapted for the object which I had in view, I obtained the charge of some patients labouring under the common form of this complaint; but which had proved rebellious to the bark, quinine, and other remedies. The general result of these clinical experiments has been already given in a preceding work; but as that result bore chiefly on the physiology of the Epidemic Cholera and intermittent fever, it is unnecessary to produce it again in this place. As my sole object on the present occasion is to endeavour to prove that the different forms of carbon are specific remedies for the class of diseases now under consideration, I shall content myself with detailing the history of some of these cases, referring the reader to the work before mentioned for an elucidation of the views entertained by me of the physiology of this class of diseases, as well as of the

modus operandi of the medicine employed; and reserving myself for a future occasion, in order more fully to explain the opinions I hold respecting the physiology and pathology of fever in general.

Case 1.—Rita Garcia, when I visited her, in Febuary, 1835, was labouring under a quotidian ague, and had been in the hospital of Alicante a month,—during which time the quinine and other tonics were administered. The disease had existed between *ten and eleven months*, having proved rebellious to the various remedies that had been employed, but the paroxysms were now shorter and less violent than before her admission. There was considerable debility, with great emaciation; and she complained of pain at the pit of the stomach, oppression at the chest, and want of appetite.

The quinine was ordered to be suspended, and thirty grains of the carbonate of soda, with twenty of tartaric acid, to be taken in a state of effervescence, an hour before the usual time of the accession, repeating the dose every quarter of an hour until four or five had been taken. The paroxysm was less severe than before, and of shorter duration; but as symptoms of fever presented themselves on taking the third dose, the medicine was suspended.

On the following day, the patient took the draught at the same time, and repeated it every half hour until four doses had been taken. Coldness of the extremities, followed by a slight and temporary heat of surface, was alone experienced.

The same plan was pursued on the third and fourth days, without the patient experiencing any unpleasant symptom, or the least return of the disease. She also remarked that the pain and oppression at the chest were relieved, and that the appetite had returned.

The medicine was then continued in the same quantity for a week, at which time, no return of the disease having been observed, the patient was consigned over to the charge of the attendant Physician.

Case 2.—Febuary 12, 1835.—Antonia Alvoreha, during her convalescence from cholera, in the same hospital, six months previously, was attacked with a tertian ague, which continued, with the exception of an interval of fifteen days, to the above date. She had taken both the quinine and the bark, but without any other

result than the above short cessation. The duration of the cold stage was from two to three hours, and that of the fever ten or twelve hours.

The carbonic acid was administered, on the next day of the attack, in the same quantity and in the same manner as to the preceding patient; and although given after the cold fit had commenced, the accession was less severe and of shorter duration than before.

During the remission, on the following day, two doses were administered, one in the morning, the other in the evening; and on the next day, corresponding to that of the periodical return of the malady, the patient commenced taking the remedy an hour before the usual time of the setting in of the cold stage, repeating the draught every half hour, until four doses had been taken.

The patient *experienced no attack*, and passed the accustomed period of the accession without feeling the slightest indisposition; and although, in opposition to my wishes and to common prudence, no more medicine was taken, the disease had not returned when I left that town some weeks afterwards.

Case 3.—Joaquin Gosalvez, Æt. 12, entered the hospital of Alicante, February 20, 1835, having suffered for a month from quotidian ague.

The patient, who had not been under any previous treatment, was directed to take the medicine as soon as any symptoms indicative of the approaching attack presented themselves; and to repeat the dose every quarter of an hour until the fever stage set in, or four or five doses had been taken. In consequence of some mistake of the attendant, only two doses were administered; notwithstanding, these proved sufficient to lessen both the severity and duration of the attack.

On the following day, the remedy was administered an hour before the usual time of the accession, and repeated every half hour until four doses had been taken. *The patient escaped the accustomed attack.*

The same plan was followed for five or six days, without the disease re-appearing, when the medicine was discontinued, the patient remaining entirely free from all ailment.

Case 4.—Juan Seldran entered the general hospital of Madrid on the 22d of August 1835, having been suffering for a week under intermittent fever. The last attack, the cold stage lasted about an

hour and a half, and the fever about two hours. He was placed on low diet, and ordered orange water as a cooling drink.

25th.—To-day, being that of the accustomed paroxysm, the patient was directed to take the carbonic acid, beginning with the first draught four hours before the usual time of the attack; and to repeat the same every half hour until four doses had been taken.

The cold stage lasted about the same time as on the previous accessions, but the duration of the fever was little more than half an hour.

27th.—On this day, four doses of the medicine were administered, the first of which was taken two hours before the usual time of the accession. No other symptoms were experienced than a slight increase in the temperature of the external surface; which only lasted about fifteen minutes.

29th.—Three doses were taken at the same time as before, without the patient having perceived the slightest morbid symptom.

The remedy was then ordered to be taken twice a-day; and the patient left the hospital cured on the 3d of September,—twelve days after his admission.

Case 5.—Pedro Trebiño, Æt. 50, entered the General Hospital, Madrid, the 15th September, 1835, with intermittent fever. Had suffered under the disease for fourteen days; at the commencement, every second day; but for the last five attacks, every day.

The same draught as in the preceding cases was administered three hours before the regular period of the accession, and repeated every hour until five doses had been taken. The patient passed the day *without experiencing the slightest attack.*

The same plan was continued for two days, but the patient not having had any return of the disease he only took the medicine twice a day for a week, after which he returned to his work quite well.

Case 6.—Pedro Gonzalez, Æt. 37, entered the above Hospital at the same time, with a quotidian ague. Had had the disease about a month, for which he took an electuary of bitters, with the effect of stopping the fever for a few days; but it having returned, he applied for admission into the hospital.

The patient being left for three days without medicine, it was remarked that the cold stage lasted half an hour, and the fever about two hours; but the paroxysm was not severe.

19th.—On this day the patient took the medicine in the accustomed manner, and *passed the expected period without any attack.*

The medicine was continued for a few days when, at his own request, he was discharged.

Dr. Roca, one of the Physicians to the Military Hospital, Madrid, who was pleased to adopt, at my suggestion, the plan of treatment now under consideration, having favoured me with the notes he took on that occasion, I am enabled to add the following cases, selected out of a number treated by this gentleman, and with a similar result. I narrate them, if not in the words of the writer, at least as literally as the translation admits.

Case 6.—Blas Adan, Æt. 19, a private in the Queen's own Regiment, was attacked *eleven months since* with a tertian ague, in consequence of having plunged into the water while in a state of perspiration; and which has returned five or six times, *proving almost refractory to the action of the bark, quinine, and other remedies,* in the hospitals of Logroño, Burgos, and Palencia. Lastly, in the journey which he has made from Vittoria to Madrid, it has annoyed him throughout the whole of the road with more severity than on any other occasion. Having, on his arrival in this capital, the 2nd of September, presented himself at the hospital, he appeared unusually pale, with prostration of strength, want of appetite, furred tongue, thirst and somnolency.

On the following day, the 3d. the accession commenced at 11 A.M.—*the cold stage lasting an hour and a quarter, and being very intense in degree,* with the skin uncommonly rough and dry; *pulse hardly perceptible,* but quick; heat in the abdomen, particularly in the epigastric region; unquenchable thirst; tongue very dry, and great pain in the head, with inclination to sleep.

On the 5th, he took four doses of carbonic acid, commencing with the first at 9 A.M. (two hours before the regular period of the accession) and repeating the draughts every half-hour. At the last dose of the medicine, the paroxysm commenced with a particular sensation along the spinal column, which the patient explained by saying it appeared as if some one was pouring water on his shoulders, and blowing on his head. After lasting 8 or 10 minutes, the paroxysm gradually disappeared *without more coldness, and without being followed by fever or other perceptible phenomenon.*

The patient continued taking the remedy on the 7th, 9th, and 11th, in the same manner; and having had no accessions or fever, he was, on the 28th, dismissed from the hospital cured.

Case 8.—Manuel Jolan, Æt. 22, in the 2nd Regiment of Guards, was seized with general coldness and shivering, which lasted three quarters of an hour, and was sueeeeded by thirst, uneasiness, and pains in the arms and knees, ending in a eopious transpiration. He presented himself at the hospital on the 18th of August, when being left (without medieine), it was observed that the fever assumed the type of a simple tertian, whieh lasted four hours and a half.

On the 21st, four doses of earbonic acid were administered, beginning at 7 A.M., *and even on this day he escaped the fever.*

On the 23rd and 25th, he took the same doses, and on the 27th only two. On the 28th a purgative was administered, and on the 9th of September he was dismissed eured.

Case 9.—Pedro Gutierrez, a recruit of the present levy, entered the hospital on the 26th of August, with a quartan ague. *He was vomited*, and *bled*, and *he took the bark* and its preparations, by the help of whieh the fever was cut short.

Having returned after an interval of eight days, the carbonic acid was given to him in the before mentioned manner, and at the second attack the fever entirely disappeared.

Case 10.—Manuel Martin Estremeño, private, entered the Military Hospital on the 26th of July, with a quotidian ague, whieh was arrested in its eourse by the administration of quinine.

But the disease *having returned* at the end of fifteen days, he was treated with the earbonie aeid, four doses eaeh day, commeneing half an hour before the usual time of the aeeession. The paroxysm progressively diminished both in intensity and duration, and disappeared altogether on the sixth day, without any relapse having been observed up to the present time (November, 1835.)

Dr. Sauch, Physician to the General Hospital in Barcelona, who honoured me so far as to adopt, almost entirely and exclusively, the same remedy, during the prevalence of the Epidemic Cholera in that town, (after having witnessed its effects in one case to which I was called in consultation with this gentleman, and Drs. Ardevol and Frau,) was subsequently induced, to employ it, at my suggestion, in intermittent fever, when he obtained, as he himself informed me, a result similar to that which has been now described. In one case,

in which the sulphate of quinine had been previously administered, the exhibition of that remedy was followed by the supervention of vomiting, purging, and all the symptoms of a violent attack of Cholera. The carbonic acid being immediately had recourse to, these unpleasant and dangerous symptoms were speedily and completely removed, and, in addition, the fever also, as no other attack was witnessed.

In order to show the effects of the remedy in another point of view, and to demonstrate, at the same time, the truth of the proposition set down in the theory I have formed respecting the physiology of fever, I was induced to employ this remedial agent in another and a different manner, viz: by the inspiration of the gas into the lungs. For this purpose, a common bladder, filled with the gas and furnished with a stop-cock and mouth-piece, was usually employed, the patient continuing to inspire, at the same time, by the nostrils, from which outlet alone the expired air was expelled. But having considerable prejudices to overcome, and my patients being generally unwilling to submit to what was to them so novel an expedient—the suggestion of a stranger and a foreigner —I was unable to complete all my observations with regard to this mode of employing the remedy. The following cases, however, will not only show, that this manner of introducing the remedy into the system is attended with the same result as in the former instances, but also prove that, in order to derive the full benefit from the use of this agent in the pyrexial stage of fever, it will be necessary to resort to the inspiration of the gas into the lungs.

Case 11.—A patient in the Military Hospital, who had been admitted under the care of Dr. Roca, was consigned over to me for the purpose of trying the effect of the inspiration of the gas. As the disease was of a very mild character, I though it a favourable opportunity for the employment of the remedy, in this manner,

during the cold stage. The patient, consequently, commenced inspiring the gas at the next aceession, so soon as the symptoms characteristic of the cold stage had set in. The first effect of the operation was to diminish the shivering, eoldness, &c. soon after which an increase of heat was pereeptible on the surface. This latter symptom, however, soon diminished, and towards the end of the opcration, the patient complained of his feet being eold and of slight ehilliness generally. After about an hour, the regular symptoms of fever set in, but they were not near so intense as on the previous accessions.

The same operation was repeated on three succeeding days, at the same time, with the effect of cutting short the disease—the intensity of the attack gradually diminishing on each accession.

Case 12.—Candido Perez, Æt. 18, a native of Vallecas, was admitted into the General Hospital of Madrid, and placed under my care on the 2nd of October, 1835. Had been labouring under intermittent fever for three weeks, the paroxysm coming on every third day—on the last attack the cold stage continued an hour and a half.

Oet. 5.—The two last days, instead of being free from the disease, he has had the accession each day, the cold stage lasting about an hour, and the fever from 4 to 5 hours. To-day, which corresponds with that of the regular return of the accession, he has again experienced an attack of the disease, which was more severe, and the cold stage longer in duration, than on the two preceding days.

An hour after the commencement of the fever, he inspired the whole of the carbonic acid gas which was evolved from an ounce of earbonate of lime, by means of muriatic acid. At the close of the operation, the heat of the skin was diminished, and the pulse mueh less rapid and strong. In fact, the symptoms of fever were so much decreased, or so entirely removed, that the patient complained during a short period of chilliness, the temperature of the extremities also being below the natural standard. After a brief interval, however, the symptoms of fever again returned, but not to the same extent as on the previous oecasions.

Oct. 6.—On this day, the patient escaped without experiencing any symptoms common to the cold stage; but the heat of surfaee was greater than natural, and the pulse stronger and fuller at the accustomed period of the accession, when the gas was again employed in the same manner as yesterday, and to the same extent.

The operation was also repeated on the two subsequent days, the last being the regular one of the accession; but not having shown

any symptoms of fever, 30 grains of the carbonate of soda were ordered to be taken twice a day, with lemon juice, in a state of effervescence; and his health being perfectly established, he left the hospital a fortnight after his admission.

In two cases of remittent fever, the same means were sufficient to arrest the progress of the disease; in the one—the milder case of the two—at the first operation; and in the other, on the third day of the employment of the gaseous remedy.

In the following case, complicated with disease of the liver, we have proof of the efficacy of the same remedy, in affections of the abdominal viscera, produced from the same cause—the malarious poison.

Case 13.—A French Officer, in the service of Spain, who had been suffering for many months with intermittent fever, was recommended to me by my friend Dr. Goicowich, during my residence in Madrid, as a proper case for the administration of carbonic acid. The patient informed me that he had been under the care of several Physicians, and had taken a great variety of remedies, but principally the sulphate of quinine,—the latter for a considerable period, and in unusually large doses, without any other effect than that of arresting the course of the disease for a brief period, and altering in some measure the type and intensity of the fever. He had also been bled, and had taken, latterly, both emetics and purgatives with some slight benefit.

The countenance was, at this time, pale, of a yellow tinge, and somewhat bloated; the abdomen tumid, with tenderness on pressure over the region of the liver, and induration of the lower edge of this organ. The appetite was deficient, the tongue white and coated in the morning, and all the various secretions and excretions faulty and depraved.

At the next accession, I remarked that the cold stage was of very short duration, not lasting more than ten or fifteen minutes; and, at the same time, mild in degree, being unaccompanied by trembling or shivering. The fever lasted from five to six hours, but the symptoms were not severe, neither was the pulse either very rapid or very full. The patient, however, complained of pain in his head and over his eyebrows, with considerable thirst, nausea, and irritability of the stomach,—the pain and tenderness over the abdomen being at the same time increased.

On the next day of the attack, the patient took the carbonic acid in the usual manner and proportions, with considerable relief; and, by a perseverance in the use of the same means for five or six days, the fever was completely dissipated, and with it, the nausea and irritability of the stomach, as well as the pain and tenderness over the abdomen.

It then only remained to restore and correct the altered states of the secretions and excretions, and to endeavour to remove the indurated state of the liver. For the purpose of effecting these objects, the carbonic acid was administered three times a-day, alterative doses of blue pill were also ordered, and, occasionally, a pill composed of the compound extract of colocynth, in order to act slightly upon the bowels.

By a steady adherance to this plan for a fortnight, the appetite was restored, the secretion of the liver improved, and the induration greatly circumscribed, while the bowels were acted upon two or three times a-day without difficulty,—whereas before, only strong and violent doses of medicine were able to produce full evacuations. The countenance also was greatly improved; animation restored; the hypochondriacal feelings which had harassed the sufferer so much when he first began this course, no longer existed; the unhealthy colour of the skin was altered, and the œdematous state of the body entirely removed.

The patient being now anxious to leave Madrid for one of the provinces, and feeling himself adequate to the journey, I was induced to relinquish my charge, contenting myself with giving him such general directions as I considered necessary for the perfect re-establishment of his health.

The above cases, it is hoped, will be deemed sufficient to establish the proposition with which I started at the commencement of this chapter, viz: that carbonic acid is capable of neutralizing the poisonous matter termed malaria, and that it remedies the effects witnessed in the various diseases produced by its deleterious influence, when present in the human body. As arguments have been advanced in a previous publication on this very subject, and as there is no other way by which to account for the action of the remedy in the above diseases, it is, perhaps, unnecessary to go over the same ground again. I may, however, briefly remark, that we

are led to draw this conclusion, first: from analogy, and from the well known fact, that the different forms of carbon combine with, and neutralize, the gaseous and poisonous products of animal and vegetable decomposition; elements which, when introduced into the body, give rise to effects similar, in a great measure, to those produced by the class of diseases now under consideration: secondly, from the circumstance that, as the remedy in question has no general or sensible action in the economy, acting neither as an emetic, purgative, diaphoretic, diuretic, or evacuant of any description, it is impossible to explain its operation unless by the above hypothesis. If it exerts any direct action in the human frame, it is that of a calmant. How then, I would ask, can we account for its operation during the cold stage of ague, when every symptom present denotes depression of the nervous energy, and when, as a consequence of this depression, so many of the most important of the vital functions are either partially or altogether suspended? It appears to me impossible to explain this effect except on the supposition that the agent in question neutralizes the morbid matter present in the system, and thus, by removing the cause of the depression is enabled to act indirectly as a stimulant, and to restore the suspended functions.

When also we find that it acts in a similar manner during the hot stage, when the phenomena present are so different; and in the intervals before the usual symptoms characteristic of the accession develope themselves; and when it is stated, in addition, that the beneficial effects of the remedy are equally observed in affections of the large abdominal organs and in dysentery, diseases which are owing to the same cause, but which vary materially in the effects produced;—when, I say, all these circumstances are considered, it seems impossible to draw any other conclusion, than that carbonic acid

is an antidote to the poison productive of these diseases, and a specific against the effects it produces when introduced into the animal economy.

But whatever explanation may be offered on this subject, and however individuals may differ in their opinions as to the supposed *modus operandi* of the remedy, one fact still remains the same; viz: its beneficial effects in the class of diseases now under consideration,—of which sufficient evidence, it is presumed, has been offered in these pages. Should it be found, in the hands of others, and upon a more extended trial, to answer the expectations which I have formed of its administration, I shall have great and good reason to rejoice in the accidental circumstance which first induced me to conclude that the different forms of carbon ought to remedy the effects produced by the poison termed Malaria.

ON DYSENTERY.

ITS CAUSE AND NATURE.

It has been already cursorily remarked that the *cause* of this disease is the same as that which is productive of the different forms of fever, viz: the introduction into the body of the poison termed Malaria. At least this is true with respect to the endemic form of the complaint, as the Dysentery which sometimes prevails in situations where the malady is not constantly produced, depends on the same causes for its existence as epidemic diseases. There are, also, other causes which produce the disease sporadically, as unwholesome food, putrid water, tainted meat; and sometimes particular kinds of flesh and fish, even when no kind of decomposition has taken place previous to their ingestion into the stomach. In the majority of cases, however, especially in localities where the disorder prevails perennially, it is occasioned by the generation of Malaria, and its diffusion in the atmosphere. As no doubt does or can possibly exist on this point, I shall not now attempt to enter into any arguments in support of an hypothesis so generally admitted by the best Authors. We may, therefore, pass at once to an inquiry into its nature or pathological conditions.

By the generality of writers, from Hippocrates downward, this disease has been regarded as an affection of the large intestines, the Moderns considering that it is simply and truly an inflammation of the mucous membrane of the colon, sometimes extending to that of the small intestines. If by the term inflammation we are to understand the injection of the capillaries, or minute arteries, in the part affected, with disorder in the functions of these vessels, we must allow that the

definition is true and satisfactory. But if, instead of the above definition, we are to eonsider the phenomena attendant on inflammation to be oeeasioned by a more rapid flow of blood through the eapillaries, and an increased activity in their functions, I, for one, am bound to deny the inferenee.

It is not now thc proper oeeasion to enter into a lengthened discussion, either with the view of disproving thc soundness of the theory generally entertained respecting the pathologieal state of the different forms of fever and inflammation; or of bringing together all the facts which might be adduced in support of the opinion I have vcntured to broaeh in a previous publication. This is a subjeet so important in itself, and so intimately connected with the advancement of medieal sciencc, that it will be more advisable to reserve the principal remarks I have to make thereon for another and more fitting opportunity.

Confining myself to Dysentery, I may statc, that I consider the morbid phenomena presented in this discase to be produced by a suspension of the funetions of the capillary vessels distributed to the lining membranc of the intestinal eanal,—more partieularly the lower portion of it, or the colon and rectum. The immediate eausc of this I believe to be not only the presenee of a poison in the system, but also, its determination to these partieular vessels in larger quantities than to other parts of the body. Instead of being propelled to the external surfaee, as I have attempted to show is the case with the same poison in intermittents, and in the eonsecutive fever of Cholera, it appears that, in this disease, from the operation of eauses with whieh we are at present imperfeetly aequainted, it is determined to thc lining membranc of thc large intestine, or at least to the sereting and other vessels distributed to this organ. That the local affection, or inflammation as it is termed,

is produced by the direct contact of some exciting agent, is rendered certain, in many instances, by the occurrence of the disease without its being preceded or accompanied by any constitutional affection,—or, at least, by such disturbance as would satisfactorily account for the production of the effects. But I cannot,on the other hand, subscribe to the opinion commonly entertained, that the dysenteric symptoms are caused by morbid secretions, either of the biliary apparatus, or of the primæ viæ. The irritation produced on the intestinal surface, by the contact of the natural fluids, which have become altered in their properties and composition, although it may add to the severity of the symptoms, is never, in my opinion, the cause of a regular attack of Dysentery ;—it is but a link in the common chain of effects, produced by the same cause.

As we witness, (as I have attempted to prove in another place) that the presence of the poison of Cholera in the capillaries of the lungs suspends their functions and arrests the circulation of the blood ; and as the propulsion of the same matter into the arterial system produces, as it appears to me, the consecutive fever, and a suspension of the functions of the capillaries of the skin, with a partial or entire arrest of the flow of blood through them—so also, in Dysentery, I infer that the same morbid condition is produced by the propulsion of the poison into the intestinal canal. Hence the absence of fæcal matter in the stools, and hence also the presence of a large quantity of mucus, either alone or in combination with blood. The increase of temperature in the part may also be explained on the same principle—the stagnation of the circulation :—for, although we are at present ignorant of the direct mode, or cause, of the evolution of heat in the extremities, we know that it is generated in the lungs, and given out at the termination of the arteries, or when the velocity of the blood from

any cause becomes diminished, and the circulating fluid passes to a state of rest. To this latter cause may be ascribed the distressing heat, and burning sensation in the venous centre, during the collapse of Cholera,—at a time when, from the arrest of the circulation, no fresh caloric has been generated in the body, perhaps, for many hours. When, however, the functions of the lungs are unimpeded, and the blood still continues to circulate through them, we ought not to be surprised at the excess of caloric which is evolved, even for a lengthened period, in certain parts of the body where the circulation is only partially arrested. As to the pain, griping, tenesmus, and increased action of the muscular coat of the intestines, it is not necessary to resort to the theory of inflammation, in the common acceptance of the term, in order to explain these phenomena. That an increase in the contractile action of the muscular coat may exist at the very time that the nervous energy of the grand sympathetic is in a state of great depression, we have proof in the Epidemic Cholera; for the fluid evacuated during the stage of collapse is generally squirted out of the canal, like water from the piston of a pump, by the violent and spasmodic affection of the intestines. That the irritation, bearing down, and tenesmus, in Dysentery, are also effects of the depression of the nervous energy, we have reason to conclude, not only from analogy, but from the common failure of such means as tend to allay over-excitement of the nervous system, and the continuance of the above symptoms until the disease has assumed a chronic form,—when, from the administration of tonics and excitants, they are (if proper means have been previously taken to expel the poison, the cause of all these distressing symptoms) speedily removed.

I am, therefore, led to assume, that the symptoms characteristic of the affection now under consideration

are caused by the introduction into the system of the poison termed malaria; or of some other septic agent which acts in a similar manner;—and that, when so introduced, it is conveyed on to the capillaries of the intestinal canal, in which situation it annihilates the nervous energy of the filaments of the grand-sympathetic distributed to these vessels, disturbing their functions, and producing an arrest of the flow of blood through them, with a partial or an entire suspension of the usual secretions given out by these vessels, as well as a morbid alteration in the fluid secreted.

That it is produced from the same cause as that which gives rise to fever, we have satisfactory evidence; for, not only do we observe this disease to prevail most in localities where continued, remittent, and intermittent fever are endemic, but these various affections are often found complicated in the same individuals at the same time. In one person, we may have dysentery in combination with intermittent fever, sometimes at the commencement of the disease, but more commonly towards its close, when the fever may be said to terminate in the dysenteric affection. The same observation holds good with respect to remittent and continued fever. That the one is not an effect of the other, we may infer from their not following in anything like regular succession, the dysentery preceding the fever in some cases, and sometimes following or existing in combination with it. Thus in the hospitals of the British army during the Peninsular war, at Alta de Chaô, Abrantes, and Santarem, "the changes from intermittent to dysentery were very common, and they seemed to suspend the intermittent for a time; but no sooner was the dysenteric affection removed, than the intermittent returned; in some instances both diseases were attacking the same patient at the same time, and when this was the case, the dysenteric symptoms were aggravated." Again, "In

the hospitals of Alentejo and Estremadura, in 1812, intermittent fever prevailed, or accompanied dysentery; it became remittent during July, August, and September, when the army was traversing Castile, exposed to the heat by day and the cold at night; and continued or typhoid, at Ciudad Rodrigo, where the sick were unfavourably situated from the unhealthiness of the locality, aggravated by the supposed effluvium extricated from 20,000 dead bodies that were calculated to have been put into the earth either in the town, or under its walls in the course of a few months."* As the dysenterie affection only assumed the form of the prevailing epidemic, being either intermittent, when intermittent fever was the prevailing disease; remittent when the same form of fever was affecting other individuals; and continued, when synochus, or typhus was the reigning malady, we must conclude that fever and dysentery are common effects of one common cause —the introduction of a specific poison into the system, and that poison the element known by the name of Malaria.

In the same manner, as I have attempted to prove, that the malarious agent traverses the whole round of the sanguineous circle, giving rise to different phenomena—as the poison is situated in the lungs, or the skin, or the venous system—corresponding with the cold stage, the hot stage, and the remission of intermittent fever; or becomes confined to one situation, as in continued fever:—so also, in dysentery, we have the same set of phenomena presented to our notice, according to the different types which the disease assumes. In some, and these are the most severe cases, it is continuous; but, in others, it takes a remittent or intermittent form,

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Sir James M'Gregor on the diseases of the British Army.—*Medico-Chirurgical Transactions*, Vol. VI.

and often, more particularly when complicated with ague, only assumes its specific character at particular and revolving periods. As these several forms of dysentery are observed to be the same when unaccompanied as when accompanied with fever, we must consider, with the author of the Dictionary of Practical Medicine, that, "they are owing rather to the concurrence of those causes to which periodicity in fever is owing, with those on which the dysenteric phenomena are more immediately dependent, than to the production of two distinct kinds of diseases." As to the difference observed in the type of the disease, the same explanation which has been offered in another place,* on the cause of the periodicity of intermittent and remittent fever, and the absence of this phenomenon in the severe form of these complaints, will, perhaps, suffice in this instance also. At any rate, the same law appears to hold good in the one case as in the other; for as, in fever, the intermittent is the mildest form of the complaint, and the continued the most severe, so also is it with dysentery. We have thus strong corroborative evidence, not only that the disease under consideration depends on the same cause as that which produces the different forms of fever, but that its type also is owing to the same combination of circumstances. We have other proof of this in the similarity of the symptoms marking the progression of the dysenteric malady.

Thus I have attempted to show, in considering the physiology of the Epidemic Cholera and Intermittent Fever, that the poison productive of these diseases enters the system with the air inspired, and then passes on with the current of blood through the arterial into the venous system, where it accumulates to a greater or less extent in different cases. After a given time, the morbid

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* *Vide* Author, on the Epidemic Cholera.

matter is, as I believe, carried forward to the lungs, where it produces disturbance in the functions of these organs; and then, after another interval, is either expelled from this situation out of the body, or else forced on into the arterial system, where, being detained in the capillaries of the skin, it gives rise to the phenomena witnessed in the pyrexial stage of fever.

Although the above is, in my opinion, the mode of progression in the majority of cases, this order may sometimes be reversed; for at other times, especially when the exciting causes are in a state of greater activity, the poison introduced into the body may not, from its increased quantity, be able to pass on into the venous system, but may become arrested in the minute capillaries of the skin, producing a disturbance of their functions, and a partial or entire arrest of the flow of blood through them. In this case, we should have continued fever without being preceded by any disturbance marking the presence of the same matter in the venous system, or the lungs. Or, on the other hand, the accumulation may still take place in the venous system, and the poison be conveyed on to the arteries, through the lungs, but in too small quantities to produce any disturbance in the latter organs during its passage. Having arrived, however, at the terminations of the arterial system, it may, from physical causes—such as external temperature, the greater or less rarefaction of the air, or pressure on the external surface of the body,—be detained in this situation, and give rise either to remittent fever when the poison is again expelled, after a given interval, into the venous system; or to continued, when it is unable to pass on into the extremities of the veins, and remains in the capillary vessels until either the death of the individual, or his recovery, caused by the expulsion of the poison out of the system, from the efforts of art or of nature.

The same phenomena are witnessed in dysentery. Thus, in a well-marked case of this disease, the attack is preceded for some days by disturbance in the functions of the stomach and bowels,—by flatulence, constipation, or diarrhœa, nausea, and sometimes vomiting. These symptoms, which bear so great a similitude to those witnessed in the premonitory stage of cholera and the malignant ague, are doubtless produced from the same cause—the presence of a poison in the venous system, but more particularly in the abdominal and portal veins. To the above symptoms succeed, after a given time, horripilations, chills, or rigors—marking the transit of the same matter through the pulmonary organs, and corresponding to the cold stage of ague. And lastly, and in succession to the above, commence the true dysenteric symptoms, an effect of the propulsion of the poison into the arterial system, and its detention in the capillaries of the intestinal canal. But, although this circumstance—the propulsion of the poison to the intestinal canal—makes the difference, and, in point of fact, the only difference, between dysentery and fever, it is seldom that the whole of the matter is conveyed to this part of the body; a given portion is, in the majority of cases, also present in the capillaries of the skin, where it produces those symptoms of fever so generally the accompaniment, to a greater or less extent, of the dysenteric affection.

This supposition respecting the situation of the poison in these different periods, and the probability that the accumulation takes place in the venous system, receives considerable support from the phenomena which arise in the two forms of the disease, termed hepatic and malignant. The former generally commences with bilious vomiting, unnatural and variously coloured stools, voided with scalding at the anus; uneasiness and pain, increased on pressure in the region of the liver; a sen-

sation of sinking and weight at the præcordia, succeeded by horripilations, chills, &c.—after which the peculiar and pathognomonic symptoms of dysentery become developed. But in the malignant ague, where, as we have reason to believe, the poison is present in greater quantities in the system than in the other varieties, the symptoms show more clearly, even from the commencement, the point for which we are now contending. There are experienced, at first, a general feeling of debility, anorexia, nausea, and borborygmi; with relaxed bowels; pale, sunken, or anxious countenance; and weak, quick, slow, and fluttering pulse, marking disorder in the circulating system, and the action of the poison on the nerves of the heart. Chills and rigors then supervene; and, after another interval, the more characteristic symptoms set in.

That the premonitory symptoms witnessed in the first variety are produced from the direct action of the poison on the liver, we may conclude from the effects that are produced; while analogy, and the phenomena which arise in the malignant form, also lead us to infer that the poison is situated in the centre of the venous or circulating system, when the disease commences; and that, when the chills are observed, the poison is passing onwards through the pulmonary organs into the arterial system. If it is allowed that the hepatic form of the complaint is produced from the presence of the poison in the portal veins (and we can hardly draw any other conclusion than that the disturbance in the liver is the effect of the direct action of the poison on this organ), there can be little hesitation in concluding also, that the primary symptoms witnessed in the other form are likewise the effects of the injurious action of the same matter on the ganglionic system while present in the veins in general, but more particularly the great

venous trunks, and probably the right side of the heart.* That these two varieties only differ from each other in the greater or less intensity of the operating causes, seems to be admitted by the generality of writers.† In fact, no other conclusion can be drawn; for they frequently co-exist in particular countries and localities at the same time, the hepatic being the common form with the strong and the robust, the well-fed and well-clothed, and the malignant with the weak and sickly, the poor and ill-fed. In other situations, we may have the former prevailing among Europeans, at the very time that the latter is attacking the dark races, dysentery being a very general and fatal complaint with the natives of intertropical climates, who are, from constitutional causes, less able to resist the morbid impression than the more vigorous European, when the disease prevails epidemically.

Lastly, it is only the supposition that this disease is caused by the presence of a poison in the system, and that this poison is determined by certain causes to one particular situation—producing, by its presence there, the characteristic symptoms of dysentery, but from which it may be again expelled, under different circumstances, to other and more vital parts—that will enable

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* If, in the first periods of this disease, in the cold stage of ague, and the collapse of cholera, the ganglionic system of nerves is alone affected, and the cerebro-spinal system entirely intact—as appears to be satisfactorily proved with respect to the two latter diseases—where, it may be asked, can the poison be situated to produce this effect? As it is clear that it cannot be present in the whole of the vessels forming the terminations of the arterial system (otherwise the brain and spinal marrow would become affected by the direct contact of the poisonous matter), and as there is no fever or other symptom present, indicative of the existence of any of the poison in the capillaries of the skin, or remaining portion of the arterial extremities, we must infer that, at such periods, it is situated in the venous or pulmonic system of vessels.

† *Vide* Dictionary of Practical Medicine.—*Art. Dysentery.*

us to account for the sudden and fatal termination of the disease in many instances. Sir James M'Gregor has informed us that, in Abrantes, in 1812, according to the report of Dr. Somers, "men who, to all external appearance, and judging from the powers of the circulation, were as well as for many preceding days, have suddenly, *and therefore unexpectedly to the practitioner*, sunk into dissolution in the course of one hour." As this occurrence was not observed until after the cold and wet weather had set in, we may fairly conclude that the change of temperature, and moist atmosphere, by constringing the vessels on the external surface of the body, and, probably, the minute arteries of the intestinal canal at the same time, had caused the sudden propulsion of a large portion of the poison out of the capillary vessels into the venous system. In this situation it will be liable to be conveyed on to the right cavaties of the heart, and thence to the lungs,—causing, when present in great quantities, paralysis of the former organ, or a suspension of the functions of the latter, by the deleterious action of the poison on the filaments of the grand sympathetic, distributed to these most important and vital parts of the animal economy. I have frequently had occasion to observe the same phenomenon both in continued and remittent fever, as well as in the consecutive fever of cholera; the patient dying, in the former instances, in a state which may be compared to the cold stage of the malignant ague, and, in the latter, to the stage of collapse.

The modifications which are observed in dysentery also shew the great analogy that exists between this disease and the different forms of fever. Independent of the symptoms which have been detailed, as characteristic of the malignant form, we sometimes have others presented to us which bring the morbid phenomena more on a par with those which arise in the aggravated

form of ague. These are, a burning sensation and heat in the epigastric region and interior of the body, whilst the extremities and surface are below the natural temperature, or even cold as marble. Another symptom sometimes present is hæmaturia, or suppression of urine—a phenomenon common both to the malignant ague and to cholera.

We have also other conclusive evidence, in the terminations and sequelæ of dysentery, that the theory now broached is a probable, if not a correct one. Thus, when the disease has been improperly treated, and tonics or astringents employed at too early a period of the attack, without having been preceded by proper evacuants, the dysenteric symptoms cease, and those arise marking the supervention of intermittent, remittent, or continued fever. In such instances, we may presume that the astringent or tonic property of the remedies, by causing a contraction of the containing vessels, has expelled the poison, not out of the excretory ducts, but into the venous system. From this situation it will be again propelled, after a given interval, into the pulmonary organs and capillaries of the skin, giving rise to the phenomena witnessed in the different stages of fever. Another of the sequelæ of dysentery, and, perhaps the most frequent, is hepatic disease ; for, although the affection of the liver is sometimes coëtaneous with that of the bowels, and even in other cases precedes it, more commonly the former follows, or is consequent upon, the latter. This form of complication is generally considered by writers on this disease to be caused by the too sudden cessation of the dysenteric symptoms, and the arrest of the biliary and intestinal secretions, either from improper treatment or some other cause. I would myself say, rather, that the hepatic symptoms are the effects of the propulsion of the poison into the veins of the liver, caused by the efforts

of nature to expel it out of the capillaries of the intestinal canal; or by the determination of the morbific matter into the capillary vessels of the liver, in common with those of the bowels and skin. In other instances, they will occur from the failure of those means usually employed to expel the poison out of the system, or from the injudicious use of remedies, as was remarked with regard to the supervention of fever after dysentery had existed in an uncomplicated form for some time.

The same remarks will apply to the affection of the spleen, pancreas, &c., the former of which is sometimes almost as frequent as affection of the liver after dysenteric attacks.

Such is the theory which I have formed respecting the physiology and pathology of dysentery. Whether it offers a more reasonable explanation of the morbid conditions presented by this disease than those previously entertained, must be left to the opinion and judgment of the profession in general. Had it not been that it appeared, to me at least, to give a probable explanation of the *modus operandi* of the medicine about to be recommended, and did not the result of the plan of treatment adopted also confirm the theory now broached, it would not have been added to a work intended to be strictly practical. But the truth or fallacy of this theory can have no influence on the *facts* which will be brought forward respecting the utility of the medicine employed; for as I would wish to rest the adoption or rejection of the plan of treatment about to be recommended on practice and not on theory, any false premises which may have been drawn on the latter point will not, it is presumed, controvert the evidence which will be advanced in support of the former.

TREATMENT.

ACUTE STAGE:—THE STHENIC AND ASTHENIC, OR INFLAMMATORY AND MALIGNANT, BILIOUS, AND SCORBUTIC OR NERVOUS FORMS OF SOME WRITERS.

Hitherto the treatment of this disease has been, for want of a specific remedy, that which may be termed the treatment by expulsion. This method, however, as we should, *à priori*, have supposed, and as experience daily proves, is too uncertain to be trusted to, if we can employ an agent which possesses the property of neutralizing the morbid matter, the presence of which in the system is the cause of all the dangerous symptoms. This remedy will be the more valuable if it possesses no injurious property, and can be introduced into the system in large quantities without producing any disturbance of the healthy functions; and if, also, it is proved that the combination thus formed between the antidote and the poison is itself innocuous. Having already inferred that this disease is produced from the introduction into the system of the poison termed Malaria, and having also endeavoured to prove that the different forms of carbon are capable of neutralizing this morbid matter, and of counteracting the effects it produces when present in the body, it would be presumed that the above agents, in some one form or other, are the remedies I principally depend on for the cure of Dysentery, both in its acute and chronic stages. Nothing can be less injurious to the living frame than these substances, as I have already remarked in a previous publication, when recommending the different forms of carbon for the treatment of the Epidemic Cholera.

That this disease is produced by the presence of a poison in the system, and that the treatment hitherto adopted—that by expulsion—is, at the best, but an uncertain method, we may learn from the success which has occasionally attended the employment of so many various and apparently opposite plans of treatment, and the utter failure of each in other instances. Thus, in the hepatic or malignant, and sometimes in the early periods of the more purely sthenic or inflammatory forms, when, as we have reason to believe, the poison is contained in the venous system, or at least a great proportion of it, bleeding from the arm (if had recourse to) may, by relieving the congestion in the veins, and producing, at the same time, a derivation of the morbific matter, from the interior to the exterior of the body, be attended with beneficial results. But in the sthenic variety, and for the relief of the truly pathognomonic symptoms in the other forms also, when these are severe, leeches to the anus, as we should, *à priori*, have supposed, and as experience daily proves, are of the most use. By this local abstraction of blood, the distention of the capillaries of the intestinal canal becomes, in some measure, relieved; and the removal of the distention, by enabling the overcharged vessels to contract upon their contents and expel the poison into other cavaties—should it not be determined directly to the exterior with the flow of blood,—may, and generally does, produce beneficial results.

So again, we can only explain the *modus operandi* of ipecacuanha, and other diaphoretics, by supposing that they act in a similar manner, viz. by their specific action on the secerning or secreting vessels. We know that this class of remedies acts powerfully on the capillaries of the skin, and excites, in certain doses, profuse perspiration. This action, there is little doubt, is extended to the same vessels in other parts of the body. If so, we may con-

clude that the benefit derived from the use of diaphoretics in this disease arises from their effects on the capillaries both of the skin and intestines, by which not only is the serum of the blood given off in large quantities, and the distention of the vessels partly removed, but a portion of the poison expelled at the same time. That these remedies act in this or some other insensible manner, appears almost certain from the result attending the administration of large doses of ipecacuanha, in the most successful cases; when an abatement of every symptom is witnessed, without the production of even vomiting or purging; and oftentimes it happens, to use the words of Mr. Balmain,* that the patient has not even a stool on the succeeding day, although previously the gripings were violent, and the discharges of blood frequent and in large quantities.

The operation of purgatives may also be explained on a similar principle. Thus, when the poison, or the principal part of it, is present in the venous system, mercurials, aloetic and other purgatives, by their effect in clearing out the liver and promoting the free discharge of bile and other excrementitious matters, often prove highly useful. On the other hand, when the poison is contained in the capillaries of the intestines, the neutral salts, more especially the sulphate of soda and the supertartrate of potash, by producing watery stools, and acting on the secreting vessels, will be more likely to expel the pent-up matter, and thus give greater relief than the preceding class of aperients.

It is also familiar to every Indian Practitioner, that one of the most successful plans for the treatment of Dysentery consists in the administration of large doses of calomel, as recommended by Dr. James Johnson. The benefit derived in this instance has been generally sup-

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* Memoirs of Med. Soc. of London, Vol. V. p. 210.

posed to proceed from the restoration of the partially suspended secretions, more especially the hepatic and alvine, and the removal of morbid accumulations of bilious and excrementitious matters. But I do not think the action of the remedy is to be explained on this supposition. Those who have taken it themselves, or have witnessed its effects in others, while labouring under an attack of acute Dysentery, will, I think, agree with me in saying, that the relief afforded by the administration of scruple doses of calomel is not an effect of the restoration of the suspended secretions, inasmuch as the almost complete disappearance of the morbid phenomena is often witnessed previous to the appearance of any bilious or alvine matter in the dysenteric stools. We must, therefore, conclude that both phenomena—the relief of the morbid symptoms and the restoration of the suspended secretions—are common effects of one particular cause—namely, the expulsion of the poison out of the system.

But although I have attempted to show that bleeding from the arm will be useful in the early stages of the hepatic and malignant forms, yet, if resorted to at a later period, and after the true pathognomonic symptoms have set in with any degree of intensity, what would then be the result of performing the same operation? The probable removal of a large quantity of the poison from the capillary vessels into the venous system, and its conveyance onward to the heart and lungs, already disturbed in their functions, and their nervous energy depressed, by the operation of a certain portion of the delcterious matter in this very situation. By this hypothesis we are able to account for the injurious effects reported to have accompanied the use of the lancet, in the British army, when resorted to in Dysentery which had followed attacks of fever, as favouring the removal of the poison into the venous trunks, and to the centre of the circulating system.

So also with regard to evacuants, as emetics, diaphoretics, purgatives, &c. If the former remedies are employed at that period when the principal part of the poison is situated in the capillaries of the intestines, little or no good can possibly accrue from their use. Neither, on the other hand, could diaphoretics be beneficial in the malignant or bilious varieties, when, as we have reason to believe, the greater part of the poison is contained, not in the capillary, but, in the venous system;—while the depressing influence of the greater number of such remedies, more especially the nauseating ones, as ipecacuanha and tartar emetic, would be actually injurious, by lowering still more the already depressed state of the nervous system. And, at the same time, aloetic and mercurial purgatives would be useless, if not injurious, in the sthenic form of the complaint, and saline purgatives in the hepatic and malignant, inasmuch as they would be acting on vessels different from those in which the poison is contained. And lastly, although I have attempted to show that calomel, judiciously administered, is generally useful in every form of the complaint,—yet, on the other hand, should it fail to expel the poison from the situation in which it is confined, either in the venous system, or in the capillaries of the bowels, this remedy, as well as every other preparation of mercury, will be likely to prove, administered in too large doses, of the greatest injury by exhausting the already depressed energy of the nervous system in exact proportion to the previous excitement. This opinion appears to be confirmed by the result of the experiments instituted by Mr. Annesley, in order to ascertain the effect of calomel on dogs; when it was proved that the colon, and rectum, and large intestines, were uniformly inflamed to a high degree by the administration of large doses of this preparation—thereby explaining, as Dr. Copland justly remarks, the results of clinical observation, viz. that although large doses of

calomel calm those symptoms usually caused by increased vascular action, or inflammation of the mucous surface of the stomach and duodenum,—or, as I should say, of the bowels in general,—they at the same time lower the vital energy of these important organs, and occasion tenesmus, griping pains in the course of the colon, mucous or bloody stools, hœmorrhoids, &c.; and, if persisted in, many more of the symptoms of dysentery, or even structural change of the colon and rectum.

If such, therefore, are the opposite effects of the same medicine in the various forms or types of this disease, can we be surprised at the contradictory accounts which have been given respecting the same plan of treatment in the hands of different individuals? One person has employed a particular remedy at one stage, or during the prevalence of one form, of the complaint; and meeting with more than usual success, has recommended its adoption to the entire, or almost entire, exclusion of all others. When, however, it has been adopted by another practitioner, under other circumstances, the same good result has not and could not possibly attend the administration—and hence its condemnation.

These cursory remarks have been made with a two-fold object:—first to confirm, by collateral evidence, the truth of the theory now broached, viz. that Dysentery is produced by the presence of a poison in the system; and, secondly, to endeavour to explain the *modus operandi* of various remedies resorted to in this disease, and thus reconcile the apparently contradictory statements of different writers on the subject. This is the more necessary, from the confused ideas that appear to be entertained respecting the nature and treatment of a malady, which was but lately treated (if it is not in the present day) by the generality of practitioners more empirically and unscientifically than any other endemic

disease. In this opinion I do not stand alone: for the writer of the article "Dysentery" in the Dictionary of Practical Medicine, remarks, "Towards the close of the last century, and at the commencement of this, the treatment of Dysentery, as set forth in various papers and works, by authorities confided in at the time, was absolutely below the standard furnished by the Antients, and by Writers of the 16th and 17th centuries, not merely in respect of the knowledge and appropriation of therapeutical means, but even as regards the justice of pathological views; without which, indeed, no medicinal agent can be safely prescribed. If any one think this assertion paradoxical, let him refer to the sources pointed out in the sequel; and, with a slight allowance for phraseology, he will perceive, that, as to this disease, as well as many others, knowledge has not always been progressive; and that the unsound and narrow doctrines in medicine that sprang up soon after the middle of the last century, have contributed not merely to its retardation, but to its retrogression." The chief obstacle, however, to the scientific treatment of this disease has arisen, not only from the absence of true and correct notions respecting its nature, but principally from want of care and discernment in noting the type of the reigning malady, and the stage when those medicines were employed which have been subsequently too highly lauded by their proposers, and too indiscriminately, and, in many instances, too blindly followed, by those who trusted to the favourable reports that have been given of them. Now, as the whole of these methods act on general principles and not specific ones, they are only applicable to certain periods, and certain forms of the disease, and require to be varied according to the varying and ever-changing nature of the malady. Not so, however, with the remedy about to be brought under consideration. As

the different forms of Carbon do not act upon general but upon specific principles—or, in other words, do not produce their beneficial effects by restoring or increasing the flow of the natural secretions, and with them the discharge of the poison itself; but by combining with, and, as we have reason to believe, rendering innocuous the pent-up matter even while present in the body;—the plan which is based upon their administration requires no change, no modifications, save one, —which is, to administer them in greater quantities in in one case than another, according to the severity of the attack, or in a somewhat different manner, according to the stage of the disease or the type which it may assume. This is an advantage which is not, and cannot be, obtained by any of those plans of treatment which may be termed symptomatic, as they are merely intended to combat symptoms or remedy effects, the removal of the cause being but too commonly altogether out of their power.

That a specific remedy is required for the treatment of this disease would appear evident by the difficulty,—nay, I would almost say, the utter impossibility,—of effecting a radical cure, by ordinary medicines, in the majority of instances of severe attacks of Dysentery. Setting aside the uncertainty of the common modes of treatment in the acute stages, how often does the patient drag on a miserable existence for many years after the disease has assumed a chronic form, until Time, that great Physician, or Nature, or change of climate, enables the constitution to overcome the debilitating effects of the morbid influence. This is not a high-drawn picture; for I can appeal to thousands of sufferers, independent of my own personal experience, who will bear me out by saying that, after running through all the varied forms of treatment applicable to the acute and chronic stages, they have, in spite of every plan,

still continued to be harassed for years by this most distressing complaint—rendering them, even in its mildest form, and chronic state, miserable to themselves, and unfitted for any occupation requiring either activity or labour. Let us take, as an example, the most common mode of treatment—that of the administration of large doses of calomel; and what do we learn? That, athough this preparation of mercury relieves the distressing symptoms at the time, restoring the patient to a state of comparative comfort and almost perfect freedom from all ailment, yet that, no sooner has the effect of the medicine on the system passed away, than the greater number of the distressing symptoms return and harass the sufferer for a more or less lengthened period. Or, on the other hand, the patient may remain entirely free from all ailment for a particular interval, after which he again falls back to his former state; and this too so soon after his previous attack, as to render it probable that the loss of strength, and deprivation of nervous energy—a result always consequent, to a greater or less extent, on the administration of mercury in large quantities—have rendered the system still more susceptible to the influence of the same morbid cause as that which produced the disease in the first instance. It was after witnessing such results, that the army surgeons, during the Peninsular War, as we find by the reports made to the Inspector-General, were induced to conclude that, although calomel cured the complaint with more certainty than other methods, if the system could be brought under its influence, yet it rendered the patient, in numerous instances, more liable to future attacks.

The same remarks will apply to the subsequent administration of tonics and astringents at that period when such remedies are, apparently, called for. How often do the former fail to restore the lost energy of the nervous

system, or remove the debility of the intestinal canal? while the latter remedies, although they may lessen the discharge of mucus for a time, are seldom able, alone, to prevent its re-appearance—in some instances it is absolutely necessary to discontinue administering them, in consequence of their effect in looking up the different secretions, more particularly the alvine and bilious, or excrementitious.

And what else, I may ask, can be expected from plans of treatment whose only aim is the expulsion of the poison by remedies which act as excitants on the nerves and vessels of the human body, which latter must necessarily become weakened in exact proportion to the previous excitement? for it is a law of the animal economy, that the vital powers cannot be raised without being subsequently depressed to an equal extent. So again, to what purpose is it that we administer tonics and astringents—the one to raise the energy of the nervous system, and the other to remedy the effects which have resulted from the presence of a poison in the body—so long as this deleterious matter, whose action has an opposite tendency, still continues to circulate in the vessels of the living frame? for such must frequently be the case when the common and ordinary methods of treatment are adopted. That many individuals carry about with them a subtle and unsuspected poison, not only for weeks and months, but even years, there is little doubt, and this, too, even when the individual has been removed to a spot where Malaria is generally supposed not to be generated. This may arise not only from the failure of the common and ordinary means resorted to for the expulsion of the poison, in states of disease, but also from the efforts of nature, like those of art, being inadequate to the expulsion of the deleterious matter; for we must conclude that, in states of health and vigour, extraneous and poisonous substances, when received into the body,

are again expelled by the various outlets destined for the discharge of excrementitious and other matters. In this way, and, as it appears to me, in this way *only*, can we account for the immunity, at particular seasons and in particular localities, of many individuals who are breathing the same tainted air that is dealing disease and death around them. But let the bodily strength or nervous energy of such persons be reduced and lowered from any cause, and let the various secretions and excretions become faulty and diminished in quantity—the natural consequence of the preceding state—and what will be the result? They immediately become obnoxious to the influence of any morbific cause which may be in operation, as is particularly evinced during epidemic periods, when such persons invariably fall early victims to the reigning malady. Did not experience, therefore—daily and dear-bought experience—teach us the necessity there is to seek for an antidote to the poison of malaria, reason herself would intimate that the employment of remedies which act only on general principles cannot be attended with invariable or even general success.

My plan, therefore, of treating this disease, whenever opportunities have been afforded me during the last few years, has been to resort to carbonic acid gas, with the object of neutralizing the morbid matter present in the system; and then, when this is accomplished, to endeavour to remedy the effects which have resulted from its detention in the system. These effects may be defined, the suspension of the various secretions and excretions, and the deprivation, to a greater or less extent, of the energy of the nervous system. This is not a matter of much difficulty, as we should have previously inferred, so soon as we have succeeded, by the administration of an antidote, in neutralizing or rendering inert the morbific matter, the cause of all the dangerous or unpleasant symptoms.

Although the remedy which has now been recommended for the cure of Dysentery is the same as that which was previously brought forward for the treatment of the different forms of fever, it will nevertheless be necessary, in consequence of the difference which exists between these respective diseases, to give a few brief directions for the administration of the medicine.

Presuming that the pathognomic or true symptoms of Dysentery arise from the presence of a poisonous substance in the capillaries of the large intestines, my practice has been, in order to bring the antidote into direct contact with the poison, to introduce it into the lungs by inhalation. As this gas cannot be introduced into the windpipe in a state of purity—neither, indeed, is it desirable—we must combine it with three or more parts of atmospheric air, or oxygen. During my residence in Spain, for want of a proper and convenient apparatus, I was in the habit of using a common bladder furnished with a stop-cock and mouth-piece, which was sufficient for all ordinary purposes. The bladder being filled with gas, the pipe introduced into the mouth, and the stop-cock turned, the patient was desired to close the lips firmly, so as to prevent the ingress and egress of any air, and to expire and inspire by the nostrils. By this means, a sufficient dilution of the carbonic acid was produced at each inspiration, by the admixture of a certain portion of atmospheric air, after the introduction of these two elements into the air passages. The pressure of the atmosphere on the external surface of the bladder was not only sufficient for the expulsion of the containing gas, but prevented, at the same time, the entrance of any portion of the expired air. By regulating the size or diameter of the tube in the stop-cock, a greater or less quantity of the gas will be taken at each inspiration, and the dilution with atmospheric air, consequently, increased or diminished in proportion.

Believing, however, that the accumulation of the poison in the body takes place in the venous system; and inferring, also, that as soon as the relaxed and distended coats of the capillary vessels recover their contractile power, by the neutralization or removal of a given portion of the poison, a part of the same matter is expelled by the action of the capillaries into the extremities of the connecting veins, my plan has been, to administer the same agent both by the stomach and bowels, either previously to the inspiration of the gas into the lungs, in combination with it, or subsequently to the performance of this operation, according to the stage or type of the disease. With this view, the common saline draught, made with the carbonate of soda and tartaric acid, citric acid, or lemon juice, has usually been employed, and administered every two or three hours in the early period of the attack, and twice or three times a day afterwards. But, for the purpose of introducing the remedy into the intestines, in order that by its absorption the portion of poison contained in the abdominal veins may be neutralized and rendered innocuous, one of two modes may be adopted. The carbonic acid can be introduced alone, from a bladder previously filled with the gas from some receptacle wherein it has been extricated; or else, a solution of tartaric acid and carbonate of soda may be injected at the moment of their admixture, and in combination with the gas then extricated. For this latter purpose, a bladder, furnished with a stopcock, may be employed; into which is to be poured a solution of tartaric acid, in the proportion of a drachm to three or four ounces of water. The fluid being allowed to gravitate to the bottom of the bladder, a string should be tied tight round the centre and above the solution, so as to prevent the escape of any portion of the fluid into the upper and empty part of the bladder. A solution of the carbonate of soda, in like quantities and proportions,

must then be poured into the empty space, and the stop-cock turned. A gum elastic pipe, made with a brass receiver to fit the top of the stop-cock, being introduced into the rectum, and the bladder attached, the handle of the cock may then be turned, and an interval allowed (after the string has been detached) for the ascent of a portion of the gas which is extricated,—when the remainder, with the solution of salt, can be injected into the bowels in the usual manner. The temperature of the fluid will of course be regulated as for other injections,—being under rather than over the degree of heat generally employed in states of health, or in other diseases, as the contact of hot fluids to the inflamed surface of the intestine is at first unpleasant, or even painful, and may therefore prevent the retention of the enema for a sufficient period to ensure the absorption of the gas.

Although I consider it of paramount importance to endeavour, first, to neutralize the offending matter—the cause of all the dangerous symptoms—it may be requisite, in severe cases, to make use of other adjuvants, as bleeding, calomel, diaphoretics, and evacuants. After the remarks, however, which have been already made respecting the *modus operandi* of these adjuvants, and their efficacy or inutility in the different stages and forms of the disease, it must be altogether superfluous to give any directions for their administration, as the same precautions, and the same rules, ought to be observed when they are given in combination with carbonic acid, as when administered alone or with other remedies.

TREATMENT OF THE CHRONIC STAGE OF THE DISEASE.

When the antidotal treatment now recommended has not been employed in the previous stages of the disease the plan already detailed should be first resorted to, and employed in the same manner as in the acute form.

As soon, however, as we have reason to believe that the whole of the deleterious matter has been neutralized, we may then commence to remedy those effects which have resulted from the longer presence of the poison in the system, and which are frequently more difficult of cure than the original complaint. The principal and most important of these is the arrest of the different secretions and excretions. To restore the former, recourse should be had to some diaphoretic, as Dover's powder, if the intestinal canal be very irritable; or, in cases of great atony, to a more stimulating remedy, as the Virginia snake-root; and to promote the biliary and alvine discharges, a combination of blue pill and colocynth in ordinary cases, or, in more severe ones, the hydrargyrum c cretâ, in small doses every night, followed in the morning by a dose of rhubarb and soluble tartar, or some other mild aperient.

But at the same time, and in combination with the above, it will be necessary to make use of some tonic or astringent, more especially in protracted cases; and the best which can be employed is, in my opinion, the *sulphate of zinc*. This is a remedy which I have been in the habit of using for some years with much success in other affections; and as its virtues are but little understood, and its employment, in the present day, very limited, I shall state shortly the circumstances which

induced me to extend its administration to the chronic form of Dysentery.

During the prevalence of the Influenza which affected nearly the whole population of London in the spring of 1833, I visited a patient under the care of my friend Mr. Bloxam, who had been severely attacked with the prevailing epidemic. As is familiar to all who witnessed any cases at that period, the disease was characterised by inordinate secretion from the lining membrane of the trachea and bronchial tubes. In the instance under review, so great was the quantity of matter discharged (amounting to about a pint in twenty-four hours) and so much approaching in colour and consistency to pure pus, that the lungs themselves were at first considered to be the source from which the expectoration was derived. A careful examination having satisfied us that these organs were *not* diseased, I proposed to Mr. Bloxam a trial of the sulphate of zinc, having been accustomed to use it in old and chronic cases of bronchitis, when the expectoration is too abundant, and there are evident signs of debility; adding, that if our prognostic was correct respecting the source whence the matter was derived, we should have ocular demonstration of it in the rapid diminution of the expectoration. This being agreed to, five grains of the sulphate of zinc, dissolved in an ounce of the infusion of roses, with the addition of five drops of the camphorated tincture of opium, were ordered to be taken every four hours.

On the following day when we called, the patient expressed himself greatly relieved: the difficulty of breathing being not only much lessened, but the diminution of the expectoration so sensible, that, as Mr. Bloxam remarked, the effect of the remedy appeared almost magical. Before, as I have stated, it amounted to upwards of a pint; it did not then exceed one third

of that quantity. By a continuance of the same plan for three or four days, the secretion from the bronchial surface was entirely arrested, and the patient convalescent.

This remedy was subsequently employed, both by Mr. Bloxam and myself, very extensively among the public patients of that gentleman; and although several hundreds, many of them most severe cases, were treated on this plan, not one individual who took the medicine was lost. This is no small proof of its efficacy, when, as is well known, the influenza was, in many parishes, almost as fatal as the cholera—although, from its insidious nature, it excited at first but little apprehension.

Believing that the above-mentioned remedy acts as a powerful excitant of the nervous system, and that it is upon the ganglionic nerves its chief energy is exerted (the very system affected in the collapse of cholera) I was induced to resort to it in that epidemic also, as has been already stated in a preceding work. Finding that the zinc, upon a more extended acquaintance with it, combined three valuable properties,—viz: that of an astringent, tonic, and excitant, I not only resorted to it in recoveries from attacks of the Epidemic Cholera, in which such a medicine is so much required, but I also employed it in many of the numerous cases of Dysentery which I met with after the subsidence of the above disease, and which, since the first appearance of the Epidemic Cholera, has prevailed in this country to a greater extent than is generally supposed. As in the chronic form of Dysentery, we are in want of an astringent, to check the inordinate discharge of mucus poured out from the exhalents on the surface of the intestines; a tonic, to restore the lost tone of the stomach and bowels; and an excitant, to rouse the latent energy of the nervous system,—this remedy

seemed to offer peculiar and valuable advantages for fulfilling these several objects. The result of the first trials did not disappoint my expectations, as will be seen by a perusal of the cases in the appendix.

In order to produce the effects referred to, it is necessary to administer the remedy in larger doses than are usually prescribed; or, at least, recommended by writers who have administered it in other diseases. From one to five grains, according to the state of depression and debility of the patient, is the quantity I have usually prescribed, combined with a few drops of camphorated tincture of opium when the stomach and bowels are irritable. It may be dissolved in the infusion of quassia or of roses, to which should be added a few drops of sulphuric acid, to render it more soluble.

These simple means are all that I have found necessary in the treatment of chronic dysentery when uncombined with organic disease, or structural change in any of the abdominal organs. In the hepatic complication, or when either ulceration of the mucous membrane of the bowels is supposed to exist, or structural alteration in the spleen or mesenteric glands, the remedies and means usually resorted to in such instances may also be employed, in combination with the plan recommended in the first part of this chapter.

APPENDIX.

The following cases, selected out of a number of others treated in the same manner and with a similar result, will, it is hoped, be sufficient to explain, the *modus operandi* of the different forms of carbon, and to prove, at the same time, that these remedies are possessed of specific properties in dysenteric affections.

Case 1.—A Gentleman, residing near London, was attacked in the Autumn of 1832, shortly after the subsidence of the Cholera, with diarrhœa, succeeded by the true pathognomonic symptoms of Dysentery—such as griping, pain along the course of the colon, bearing down, tenesmus, and frequent calls to stool, when a considerable quantity of mucus was discharged, sometimes accompanied with a small portion of feculent matter, and sometimes alone. There were no symptoms of fever present, but the tongue was furred, and the pulse slightly accelerated, with an increase of heat over the abdomen. An exacerbation of all the distressing symptoms usually occurred towards morning, and a remission, more or less complete, in the evening.

Aperients were at first administered, but without producing more than temporary relief. Astringents were then had recourse to, which succeeded in checking the frequency and looseness of the motions; but the irritation, tenesmus, &c. were increased in consequence.

At this period, the patient commenced to take the carbonic acid, disengaged from the carbonate of potash by means of tartaric acid, in the proportion of thirty grains of the former to twenty of the latter. The first dose gave some relief; and after the fourth, the griping had entirely ceased, leaving only tenesmus, and still frequent, though diminished, inclination to go to the night stool, when mucous and feculent matter were passed as before—the latter, however, coming away more freely and in increased quantity.

By a continuance of the same plan for a week, the distressing symptoms which had harassed the patient at the commencement of the attack were entirely removed, leaving only slight tenesmus and bearing down, increased each time that a motion was passed, which was usually the case every three or four hours. The quantity of mucus was now much diminished, and the evacuation itself became also more consistent.

The sulphate of zinc, in doses of three grains, was then ordered to be taken twice a day, in an ounce and a half of infusion of roses; and by the employment of this remedy, combined with the carbonic acid, (which was

still administered night and morning,) every unpleasant symptom was removed, the bowels having entirely regained their healthy action, and the discharge of mucus being also arrested.

Case 2.—A Female, residing in London, was attacked with purging, and, soon after, vomiting, attended with much pain and tenderness over the abdomen. She had been ill three days when I saw her for the first time.

The state of the patient was then most pitiable. In addition to the vomiting, there was much pain in the right side and under the margin of the ribs, with excessive tenderness on pressure; a hard quick pulse, and great heat over the abdomen, which was tense and tumid. Chills had been experienced the day previous, quickly succeeded by griping pains about the lower part of the abdomen, with frequent calls to stool, and other symptoms marking the true character of the disease. The fluid thrown up from the stomach was bilious and of a green colour.

The carbonic acid was ordered to be taken in the same manner as in the preceding case, the first dose of which was sufficient to allay the irritation of the stomach, and prevent any return of the vomiting. The medicine being continued every three hours during the day and night, a striking and pleasing change was observed on my next visit; for not only had no return of the vomiting been experienced, but the purging also had ceased, and the pain and tenderness of the abdomen become greatly diminished, the patient being now able to lie on the right side, which previously she was incapable of doing. The dysenteric symptoms, however, had not lessened much, if any thing, in intensity, as there were still considerable irritation, tenesmus, and incessant calls to stool without being able to pass more than a little mucus and blood. The medicine was therefore ordered to be continued every four hours, five grains of the carbonate of ammonia and twenty of the carbonate of soda being substituted for the thirty grains of soda previously taken, the quantity of acid remaining the same.

At my next visit the patient expressed herself entirely relieved from the pain in the side, as also the griping in the abdomen, leaving only slight tenesmus and irritation in the rectum, with inclination to go to the night stool every four or five hours, when a considerable quantity of mucus was generally passed, slightly streaked with blood. A dose of castor oil being now prescribed, the carbonic acid was discontinued until the purgative operated, which it did in a few hours after its administration, bringing away a considerable quantity of offensive dark-coloured and feculent matter.

This patient being too poor to obtain the necessary comforts which her situation required, and having no one but her husband, who was engaged the greater part of the day at his business, to give her any assistance, was now induced to apply for admission into the workhouse, which being obtained, she was, at this period, removed from my care.

Case 3.—A Spanish merchant, accustomed to reside the greater part of the year in England, was attacked shortly after his arrival in Cadiz with pain in the right side, vomiting, and purging of bilious matter. To this succeeded chills, fever, and slight dysenteric symptoms, dysentery being a very

common complaint in the above town with all strangers. There was, at the same time, a yellow tinge of the skin with slight suffusion of the eyes, and high-coloured urine, voided only in small quantities.

Being requested to visit this gentleman, I prescribed saline effervescing draughts, one to be taken every three hours. This had the effect of immediately checking the vomiting, the diarrhœa also being removed after five or six doses had been taken. The dysenteric symptoms, however, had rather increased in intensity than otherwise during this period.

By a continuance of the same plan for two days, the fever had entirely subsided, and the dysenteric symptoms were so much relieved that they occasioned little or no annoyance to the patient. One grain, therefore, of calomel, and three of Dover's powder were now ordered to be taken at night, and on the subsequent morning ten grains of rhubarb and five of jalap, to clear the liver and bowels of any morbid matters which might remain in the primæ viæ; and, during the day, one or two effervescing draughts. This plan sufficed to restore the patient in a few days to his accustomed health, leaving only a slight yellowness of the skin, which, however, speedily disappeared without recourse being had to any other medicine.

From the first employment of carbonic acid in Dysentery, some years since, to the present time, I have continued to administer the medicine in a considerable number of cases, and, generally speaking, with a similar result. There was, however, one difference in the effect of the medicine which could not fail to attract my attention, even at the commencement of these clinical researches. The difference here alluded to is, that the relief afforded was greater in those cases which partook rather of that form of complaint termed hepatic, than of that known by the name of sthenic, when those symptoms pathognomonic of the disease, and which mark disorder in the large intestines, are alone present. Although considering it, even then, as probable that this distinction arose from the different situations of the poison, in these several instances, it was not until the conclusion of those investigations which I subsequently instituted in order to ascertain the position of the same morbid matter in the various stages and forms of fever, that I adopted any direct experiments in order to ascertain this interesting point. The result was, the formation of the theory already given respecting the physiology of this disease—in confirmation of which, as well as to show, in a practical point of view, the effects of the remedy administered in a different way, the following cases are now added :—

Case 4.—This individual, whose case, No. 11, has been already related as suffering under remittent fever, was also affected, at the same time, with dysentery. Thinking it, therefore, a favourable opportunity for the inspiration of the gas, I was induced to resort to this method of employing the remedy, and in the manner already described. It should be remarked, that the disease was not of an acute character, but there was much irritation of the bowels, with constant desire to evacuate them, as often as twenty times in the course of the day and night—the motion consisting almost entirely of mucus, sometimes mixed with blood, and sometimes, but rarely, containing scybalæ.

The first effect of the operation was to lessen considerably the irritation and tenesmus, as well as the frequency of the motions; but they became, at the same time, increased in quantity, there being not only more feculent matter, but also an increase in the mucous discharge.

The inspiration of the gas a second time not only lessened, to a still greater extent, the intensity of the above symptoms, but the quantity of mucus discharged, and the frequency of the motions, were so sensibly decreased, that the patient considered himself freed from all ailment.

The third operation completely removed every unpleasant feeling and morbid symptom.

Case 5.—A gentleman residing in the same house with me, during my sojourn in Spain, was attacked with Dysentery, the case presenting the purely sthenic form. He complained of much pain, griping, irritation along the whole course of the large intestine, considerable tenesmus, and frequent, indeed, almost constant desire to go to the night stool, when mucus, slightly streaked with blood, and occasionally (but rarely) mixed with feculent matter, was discharged.

The carbonic acid being prescribed, the patient took a dose every three hours. On the following day the griping had entirely ceased; but the irritation and tenesmus, with frequent desire to go to stool, still continued—the quantity of mucus discharged also remaining the same.

By a continuance of the same plan for three days, every unpleasant symptom was removed, except tenesmus and irritation about the anus, with two or three dysenteric stools daily, the patient having a regular, but not natural motion, (as the matter passed was in the form of scybalæ,) once or twice a day beside.

Believing that the persistance of these symptoms was to be ascribed to the antidote being unable to reach directly that portion of the pent-up matter situated in the capillaries of the intestines, I determined to try the effect of the inhalation of the gas. The patient experienced immediate relief, even after the first operation, and the second removed every morbid symptom, excepting a slight increase in the quantity of mucous usually secreted into the intestines, which, however, entirely subsided in two or three days, without the use of either tonics or astringents.

Case 6.—To this individual, in whom the disease put on the hepatic form, I was induced, instead of the above methods, to administer the gas by the rectum, in the form of enema.

An apparatus similar to that already described being obtained, the gas liberated from a drachm of carbonate of soda and tartaric acid was injected into the bowels, together with the mixture produced by the combination of the two solutions. The inflation and distention of the gut caused considerable pain for a short time, but it soon subsided, and the patient was enabled to retain the whole of the injection for nearly twenty minutes.

Considerable relief was experienced from the injection, the inclination to stool being not only diminished, but the motion passed with much less pain and with an increase in the quantity of feculent matter. The opera-

tion was then repeated twice or three times daily, for three or four days, with the effect of relieving all the distressing symptoms, excepting slight irritation and tenesmus, with a morbid discharge of mucus.

In order to complete the cure, and in accordance with the theory previously broached respecting the pathological conditions of this disease, the gas was now administered twice by inhalation, which sufficed entirely to remove the remaining symptoms.

The following cases are selected from a number of others treated on the same principle, but at a later period, after the disease had assumed a chronic form.

Case 7.—Having contracted Dysentery, from exposure to the malaria generated in that most pestiferous of all islands, Java, and being *then* an implicit believer in the efficacy and harmlessness of calomel, I resorted at once to this drug, and took it in large doses, a scruple at a time, with the effect of allaying every unpleasant symptom. In fact as soon as the system was fully under the influence of the calomel, my state appeared to me to be Elysium itself compared to that which existed previously, for the torments of Tantalus can scarce exceed the horrid sufferings of a patient labouring under an attack of acute dysentery. But no sooner had the mercurial action subsided, than the unpleasant and pathognomonic symptoms of the disease returned, and continued to harass me without intermission. Other remedies having failed to give me relief, recourse was had a second time to the calomel, and with a similar result, viz. the subsidence of the dysenteric symptoms during the time I was under the influence of the mercury, and their return as soon as the mercurial action went off. A third and a fourth time the same phenomena were witnessed, until my former faith in the virtues of this remedy being somewhat changed, I resorted, at the suggestion of a medical friend, to diffusible stimuli, without which it is probable I should not have reached England alive.

The combined operation of these causes, however, left me in a state from which I did not recover for several years; my dysenteric affection which had then become chronic, continuing to harass me continually, and being aggravated by every slight circumstance, such as irregularity in the mode of living, or exposure to atmospherical influences. It was not until I adopted the plan of treatment now proposed, that I lost the tendency to returns of the complaint; and it was not until then that tonics succeeded in restoring the lost energy of the system, or, that astringents were sufficient to arrest the morbid discharge of mucus, and to give tone and strength to the intestinal canal.

Case 8.—An officer in the service of the Hon. East India Company had been suffering for some years with chronic dysentery, the result of an acute attack in India. At the time I saw him, the general health was not much impaired; but the patient was harassed by the continuance of the dysenteric symptoms, to remove which various plans of treatment had been adopted in vain. This gentleman informed me, that he usually had a feculent motion, consisting of scybalæ and mucus, every morning; and that

about an hour after, another call to stool was experieneed, when a regular dysenteric motion, eonsisting of mueus and a small quantity of blood, without any traee of fœcal matter, would be passed. The same oecurrence would take plaee twice or three timcs during the day, attended with pain and griping in the course of the colon, as the morbid matter was passing along the bowels, rumbling, distention, and discharge of flatus.

At this period the patient, tired of running round, like a horse in a mill, the entire eirele of remedies usually resorted to in this diseasc, had suspendcd the employment of medieine altogether, wishing to try what effect time, and change of elimate (for he was then in England) might have on his eomplaint.

Having eonsulted me, however, and being prevailed upon to try the effeet of carbonie aeid, he eommeneed with this remedy, taking it three times a day, in the form of the eommon saline effervescing draught. When I next saw the patient, whieh was a week afterwards, he informed me that he already felt more relief than he had done from any plan previously adopted. The quantity of mueus now diseharged was nearly the same as before the administration of the above remedy; but the tormina and rumbling in the bowels, and discharge of flatus, had eonsiderably abated, the fœees also being rather more eopious and not so unnatural.

The same plan was, therefore, advised to be eontinued for another fortnight; at the end of which time, the patient expressed himself almost wholly relieved—the appetite being now good, and all the distressing dysenteric symptoms having nearly disappeared, leaving only slight tenesmus, with an unnatural diseharge of mueus. The bowels were at this time acted on twice or three times a day—the prineipal motion, that in the morning, being more natural than at any previous period.

The sulphate of zine was now ordered to be taken twiee a day, in doses of three grains, dissolved in an ounee of the infusion of roses, and the carbonic aeid three times during the intervals, which suffieed to restore the patient, in about a month, to his aecustomed health. It should be stated, that, during this eourse, a mild aperient was employed whenever the bowels beeame eostive, whieh, however, did not oeeur until the latter part of the period during which the zine was taken. As, also, under the above treatment the stools regained their natural colour and eonsistency, thus showing that the biliary secretion was restored and had become healthy in quantity as well as quality, it was deemed unneeessary to resort to any of the preparations of mercury.

Case 9.—Being in the country in the spring of 1833, I met with a young female who had been labouring under an attaek of dysentery between five and six months, all the efforts to arrest it previously having failed. It is a remarkable eireumstance that, in that part of England, the Epidemic Cholera had not been witnessed, excepting in one solitary instance, in whieh the patient presented all the true symptoms of the disease, having died in the eold or blue stage; but a great many bowel eomplaints had occurred, many of them presenting, to a greater or less extent, the dysenteric type. At the time I saw this patient, the pathognomonic symptoms of the eomplaint were exceedingly well marked, and the stools, which were more or less tinged

with blood, equally characteristic. The carbonic acid being had recourse to, the symptoms gradually and regularly decreased in intensity; and at the end of about a fortnight, the griping, discharge of blood, and pain in the bowels having disappeared, and slight tenesmus, with mucous discharge, alone remaining, the sulphate of zinc was prescribed in the infusion of quassia, three grains of the former to two ounces of the latter, which quantity was taken twice a day. It should be observed, that the motions were now much less frequent than before, the patient being only disturbed three or four times a day, whereas previously the bowels had been acted on every three or four hours. The matter passed was also very different, being more natural, and, although still loose, both feculent and abundant, instead of consisting only of scybalæ, blood, and mucus.

By the use of the zinc, the quantity of mucus was lessened daily, the tenesmus and irritation diminished in proportion, the consistency of the stools increased, and by the end of three weeks, the healthy action and tone of the intestines were entirely restored.

Case 10.—An elderly female, whom I visited at a period subsequent to this, had also been suffering from about the same date with acute dysentery. In addition to the usual symptoms, were superadded great prostration of strength, extreme emaciation, want of appetite, and debility of the stomach, as well as of the system generally.

Thinking it necessary to restore, as speedily as possible, the lost energy of the body—for the patient was so low and reduced, that it appeared doubtful whether any remedial means would be of avail, I resolved to commence at once with some tonic; and the sulphate of zinc, therefore, in doses of four grains dissolved in two ounces of infusion of roses, (to which were added five drops of dilute sulphuric acid and the same quantity of the camphorated tincture of opium,) was taken once a day, and the *carbonic acid* in the usual proportions during the intervals.

A week's continuance of this plan was sufficient to restore the patient to a state of comparative comfort; the irritation and griping in the abdomen being not only greatly diminished, but the motions having become feculent and abundant, whereas previously the excretion of alvine matter was almost entirely suspended. As, however, the motions were still loose and dysenteric—consisting sometimes of pure mucus, being at other times muco-purulent, and always containing more or less blood—and as the debility, both of the stomach and system generally, still continued great, it was judged necessary to reverse the previous order, more especially as the disappearance of the irritation and other symptoms rendered the administration of the antidote less necessary at this period. Instead of the zinc being taken only once a day, it was now administered in the same proportions twice a day, and the carbonic acid three times a day.

This plan was continued for a fortnight; when the bowels appearing to have regained their healthy action, and being rather costive, after having acted regularly twice a day for some time (*without the use of aperients*), it was judged unnecessary to do more than to administer the zinc once

a day. As, also, the dysenteric symptoms had entirely subsided—there being neither griping, irritation, or tenesmus—the carbonic acid in like manner was reduced to one draught daily.

By the use of these medicines for a few weeks, occasionally combined with a mild aperient, the strength of the patient was almost entirely restored; the appetite had returned, and was, in fact, more than natural; the healthy action of the bowels was confirmed; and the general health so perfectly re-established, that the further administration of medicine was considered to be unnecessary.

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